Augmented approach to desirability function based on MM estimator

ABSTRACT

The desirability function approach is commonly used in industry to tackle multiple response optimization problems. The shortcoming of this approach is that the variability in each predicted response is ignored. It is now evident that the actual response may fall outside the acceptable region even though the predicted response at the optimal solution has a high overall desirability score. An augmented approach to the desirability function (AADF) is put forward to rectify this problem. Nevertheless the AADF is easily affected by outliers since the AADF is constructed based on the Ordinary Least Squares (OLS) estimate which is not resistant to outliers. As an alternative, we propose a robust MM-estimator to estimate the parameters of the Response Surface Model (RSM) and incorporated the estimated parameters in the augmented approach framework. A numerical example is presented to assess the performance of the AADF-MM based method. The numerical results signify that the AADF-MM based is more efficient than the AADF-OLS based method.

Keyword: Desirability function; OLS-estimator; Optimization; Response surface model; Robust MM-estimator